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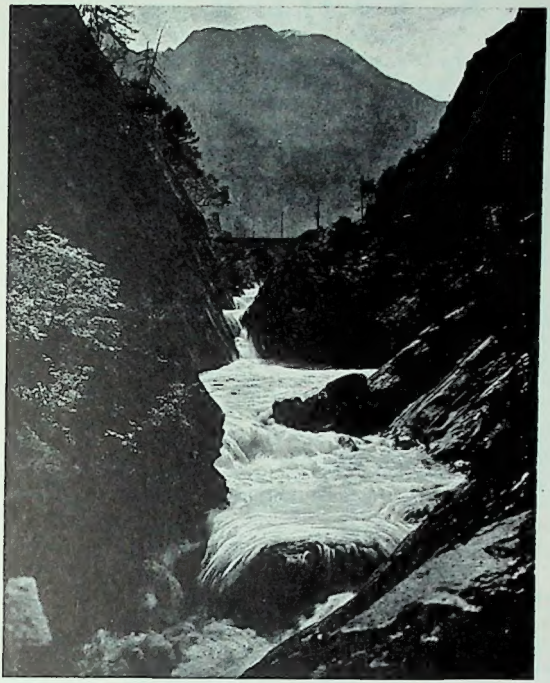

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A STUDY OF METHODS

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WHY IS EVOLUTION BELIEVED?

SCIENCE RETREATS TOWARD GENESIS

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A STUDY of METHODS

BY GEORGE McCREADY PRICE

WHENEVER one becomes at all critical of the methods employed in certain of the theoretical departments of natural science, some teachers of these sciences seem to suffer from a persecution complex. One expects to hear the retort, "Art thou also of Tennessee? Search and look; for out of Tennessee arises no scientific prophet."

The geologists are the most sensitive to this criticism regarding methods; perhaps because they have had so much of it. In the early days of natural science, when the collecting of fossils was about on a par with the present vogue of collecting old postage stamps or old coins, most people did not take very seriously the claims which these fossil collectors used to make as to their ability to tell the age of the various deposits. But fortunately for this science, the various Governments of the western world found it necessary to subsidise geology very heavily by employing specialists to survey the various localities which promised to yield important minerals. The result was that little armies of specialists, trained in the methods of identifying the rocks by their contained fossils, were formed in practically all the countries of Europe and especially in America, and the results of their field work were everywhere published in elaborate monographs at Government expense. Thus the field results of geological surveys rapidly accumulated in almost endless variety and in prodigious amounts; so that it was not long before the mere quantity of these publications began to exercise a smothering and stupefying influence over any further progress in a true understanding of the theoreti-

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cal aspect of the science. Unfortunately this overwhelming flood of geological literature began before the science had been placed on a true inductive basis, that is while it was yet in its speculative stage. For every science goes through an age of speculation before it reaches a stage of development where facts are always given the right of way over theories. Until this stage in the development of a science is reached, the science is at the mercy of every upstart theory that may be propounded. And it is a very unfortunate thing when a science continues long in this speculative condition. Until this stage is outgrown no science can be regarded as having been reformed and placed on a secure basis. Over half a century ago, Dr. Whewell lamented that "The Newton of Geology has not yet appeared." And one must confess that these words are as true to-day as when first written.

But geological speculation has a very ancient history. It might almost be said that in this sense geology is one of the oldest of the sciences. The Greeks and Romans found fossils on the sides of the hills, and they speculated as to the vicissitudes of the earth's surface. After the revival of learning, which was rather a revival of the methods of studying nature than a mere revival of studying the Greek classics, it was a common thing for natural philosophers, as they were called, to indulge in theories as to how the fossil shells happened to be found in the mountains or fossil leaves of plants deep down in the earth. Unfortunately the other sciences were not sufficiently advanced to enable the students of the fossils to make an intelligent guess regarding the methods by which the fossils were formed. As Karl von Zittel has pointed out, considerable progress had been made in understanding the structure and nature of rock formations long before the essential facts in the related sciences were known. He says, the early speculations regarding the igneous origin of the crystalline rocks "had been laid without the assistance of chemistry," and before anything was known of the microscopic structure of these rocks. ("History of Geology and Palaeontology," pp. 327, 341.) In the same way the whole series of fossil plants and animals had been blocked off and even the minor details of the geological series pretty well fixed and arranged previous to 1820, or before anything of importance was known of any living class of animals save the mammals. (*Id.*, pp. 128-137.)

One of the dominating ideas in those early days of geological study was the theory that absolutely all of the

fossils belong to extinct species. It was not a former stage of our modern world with which those early students of the rocks thought they were dealing. Rather it was a phantom world, a mere ghost of a time long vanished, with no possible connection between that world and this. Assuming that all of the fossils were extinct, it was easy enough to arrange them in a supposed chronological order according to the relative positions of sequence in which they happened to be found where first observed. Quite innocent of any knowledge of where or how such animals as the crinoids or the brachiopods or the cup-corals are found in our modern world, how easy it was for them to assign all the fossil representatives of these classes to that phantom world which they had constructed in their imaginations. And when under the progress of zoological exploration modern representatives of these creatures were fished up from the bottom of the ocean or from some out of the way corners of the globe, how easy it was to say that the fossils and the modern forms are not quite identical, and thus still maintain the tradition that the fossils are all "extinct species," though possibly belonging to the same genera and families as many modern representatives.

But let us try to get a view of the modern situation in theoretical Geology, illustrating the situation by means of an illustration.

Suppose there was a great globe away off somewhere in space, and you were asked to examine it in detail and to make a scientific report upon it. And suppose you found this globe to be somewhat like our earth, covered quite generally with rocks in strata or layers, evidently formed by water, these strata containing many relics of former living plants and animals. And your job was to examine this entire globe in a full and scientific manner and make a report upon the history of this globe and of what happened upon it in the long ago, in the light of the evidence you could decipher from these rocks.

Evidently, your problem would be very much like that of our geologists. You would be a sort of coroner, holding an inquest over this globe, with an honest endeavour to reach real truth so far as would be within your power.

What method of investigation would you pursue? Obviously, you would want to know first of all the present behavior of the forces of nature on this globe, how the water, the air and the weather are now modifying the surface of this globe in any way; then by projecting this

present behaviour back into the past, you could judge whether or not this present behaviour of the forces of nature would be sufficient to produce the effects which you found recorded in these rocks. But would you be prepared to frame any safe theory as to the general cause of these ancient changes, until you had learned all you possibly could regarding the present-day action of the forces of nature?

Consciously or unconsciously, you would almost certainly form some sort of a theory as to the manner in which these fossils got in these rocks and form this theory just about as soon as you first saw them. It would be the hardest thing in the world to hold your mind in a strictly non-committal attitude until the evidence was all in. But this would be the only scientific procedure; for would it not be extremely unscientific to jump to a conclusion regarding this matter while as yet you had but few of the data necessary for the framing of any safe induction regarding their causes?

Coming back to our own globe and the problems connected with it, we may ask ourselves, when was it that geologists framed the theories of uniformity and of the order of succession of the fossils under which we are now working? Did these early pioneers restrain themselves and hold their theories in abeyance until a reasonable proportion of the evidence was all in, so they could frame a safe induction which would be likely to endure? Hardly; the theories under which we are now working were propounded and had secured the almost unanimous adherence of geologists long before anything of any consequence had been learned of the rocks outside of a few small localities in northwestern Europe and eastern North America. Lyell had visited the places just alluded to; but how was it possible for the few observers then in the field to learn anything save in the most general way even in these localities? As for "Strata" Smith and Cuvier, they had never been outside of their own home countries; and although Cuvier was a very competent naturalist and a real mental prodigy, what did he know of the order in which the fossils might be found occurring in western America, in Australia, or in South Africa?

In the light of many recent geological discoveries in widely separated portions of the globe, it is now becoming very evident that these old-time theories, under which we have been working for nearly a century, will have to be revised; and the sooner we can divest our minds of

the incubus of these long cherished prejudices about the earth's being a cooling mass of molten rock and about the alleged invariable chronological order of the fossils, the better will it be for the science of geology, possibly better also for our own individual reputation with posterity.

It seems high time that we as geologists should call to mind again some of those elementary principles regarding the relationship between facts and theories, which have guided all the great masters in natural science, but which many of us seem in great danger of forgetting, this lapse of memory being the chief cause of all the blunders made in the name of science.

Every form of natural science consists of two essentially distinct parts, facts and conclusions, the latter being of all shades and degrees of certainty, from those which seem to be inevitable or almost mathematical, to those which are merely tentative, adopted provisionally as mere working hypotheses for application to other facts as yet not obviously related to them. Of course we never wholly succeed in keeping our facts and our conclusions in two separate, watertight mental compartments. And yet we approach scientific certainty and attain to mental clearness, just in proportion as we succeed in thus separating the sheep from the goats, that is, in segregating our proved facts from our reasoned theories in explanation of these facts.

For facts and conclusions are essentially distinct in their natures. Facts are the raw materials with which science works. They are the bricks; but bricks alone without methodical arrangement do not make a house. We need some cement or mortar between the bricks, this cement corresponding to our many incidental or minor theories or assumptions. But we must also arrange our mass of materials together in some definite or orderly way, this arrangement or organization of our materials constituting them into a structure or a science. And this general form of a material structure would correspond to our fundamental primary assumptions and our wide conclusions or general theories. No mere quantity of facts alone can make a science; the facts must be brought into appropriate relationship to one another, that is, the facts must be "explained" by some conclusion, this explanation being technically known as a theory, an induction, or a generalization from the facts under consideration,—not merely from all the facts which we know,

but to be a really safe and reliable conclusion or generalization, it must embrace all the facts in the universe pertinent to the matter.

Thus conclusions arrived at from any two or more facts and designed to "explain" them, or designed for the purpose of putting them in right relationship to one another and to still other facts, become *theories;* and there can be no organization of facts, or in other words no science, without many theories.

But theories are of little value unless they are to be used; and any theoretical "explanation" of a group of facts when used to explain still other facts, becomes an *hypothesis.* That is, a theory put to work is an hypothesis, and hypotheses are always dangerous things. We always put our intellectual freedom at stake, whenever we adopt an hypothesis. True, we can make absolutely no progress in any line of science without using them; and yet they are more dangerous than dynamite. And the longer we use an hypothesis, and the more success we have had in using it to explain other facts, the more surely do we become its slaves and the more hopeless our future intellectual slavery, if this hypothesis happens to be really wrong; for a cherished hypothesis blinds the eyes of the observer to new facts, just as a gift has been said to blind the eyes of a judge in court; for we never persevere in making experiments or observations to test out an hypothesis in which we have acquired considerable confidence; indeed we often will not listen to the testimony of others who claim to have tested it, if their results do not tally with what our pet hypothesis has taught us.

We all remember how this psychological principle worked out in the case of A. G. Werner and his disciples. The father of Neptunism had acquired considerable skill in identifying various minerals, and he taught his pupils that the various schists, limestones and sandstones are always to be found in a very definte sequence. From the universal primitive ocean he declared there had been precipitated first the granites and associated greenstones, next the hornblende schists and porphyries, followed in exact sequence by limestone, coal, basalt, and ores; then by sand, clay and soapstone; and finally by volcanic ash, some lavas, and jasper. Since these substances had been deposited in this exact order, he assured his pupils that over the whole earth they would invariably find the rocks in this relative order of sequence, except where they might

have been subsequently disturbed. As these pupils went out over the rest of the world, they felt that they ought always to be found in a very definite sequence as they had been taught. And whenever they were so unlucky as to find the rocks in southern Europe, or Canada, or Mexico in some other order than that in which Werner had found them in his narrow little district of Germany, they always felt conscience smitten and were sure there must have been some fault or displacement somewhere in the neighbourhood to put the rocks in this unnatural position. Even the scholarly and keen-eyed Von Humboldt, in his extended trip through Central and South America, reported that the rocks which he saw there agreed with Werner's chronology, and he wrote his huge books explaining them in this way.

Furthermore when some men of independent minds tried to point out specific examples here and there where the rocks were in a very different order of sequence, they had to brave a veritable tempest of scientific opposition. It took many years before they could convince the world that Werner's limited experience in the Erz Mountains in Saxony and Bohemia had not endowed him with any supernatural knowledge of how the rocks might yet be found in some region on the other side of the globe.

The geologists of that time were obsessed with the idea that their science must be a *cosmogony*, and that the strata must somehow be made to tell the secret of the development of the earth and of its inhabitants. Accordingly, under the leadership of "strata" Smith, the naive land surveyor of England, and of Cuvier, the great overtowering genius in zoology and comparative anatomy, fossils were substituted for lithic characters as the true criteria for determining the "age" of a rock deposit, thus quietly substituting a biological-onion-coat theory for Werner's theory of onion-coats of minerals. Various scientists kept protesting for several decades, Herbert Spencer saying that, "though the onion-coat hypothesis [of Werner] is dead, its spirit is traceable, under a transcendental form, even in the conclusions of its antagonists" [Sir Charles Lyell and his followers.] But even in this third decade of the twentieth century we have not yet devised any method of shaking off this geological old man of the sea, the theory of organic onion-coats.

If we attempt to estimate whether we have made any progress under the reign of this organic-onion-coat

theory, I would say that we are now about in the Von Humboldt stage of this theory. With our hundreds or thousands of examples of "disconformity" or "deceptive conformity," to use W. B. Scott's expressive phrase, and with many great areas covering thousands of square miles where the rocks are in the "wrong" order, examples which we choose to call "thrusts" or "thrust faults," we already have plenty of facts contradicting this theory. But we still have so much reverence for what "Strata" Smith and Cuvier taught us to expect over all the rest of the globe, that we continue to believe their teachings even when the latter are directly contradicted by our eyesight and common sense and every objective physical evidence. We invent a "fault" in the rocks rather than harbour the suspicion that there may possibly be a fault in our theory. What a pitiable picture modern geology presents, still helplessly dominated by the hypnotic spell of men who have been dead nearly a century, even when we are confronted with a vast multitude of facts which make the theories of these men look like the childish "science" of the Middle Ages.

To illustrate the situation, let us suppose a case.

Suppose that William Smith and George Crétien Cuvier had been born on the western prairies of North America. Perhaps we ought also to include Adam Sedgwick and Roderick Murchison. Suppose they early became well informed naturalists, and in due time became acquainted with the so-called great "faulted" area in Alberta and Montana, where 20,000 or 25,000 square miles of Paleozoic strata are on top of Cretaceous beds, with every physical appearance of having been actually deposited in this order, and with hundreds of outcrops scattered all over this area which look exactly like examples of normal conformity.

Let us suppose that our four young friends undertake to frame a theory of world geology on the basis of what they have here discovered. Three possible explanations would be open to them:

1. They might assume that we have here a record of successive creations and catastrophies which have taken place on the globe;
2. They might assume the uniformity of natural causes, and take these strata as representing a universal order of sequence in which the rocks would be found everywhere on earth;

3. Or, they might say that these are *mere local phenomena*, representing local floras and faunas which at some time or times in the past lived and were buried here. But (they might say) we do not have enough data from these localities alone to judge of the causes which may have produced these great changes. Any theory of the cause of these changes, to be adequate, would have to take into consideration all possible information from all other parts of the world. Only when a reconnaisance of the world as a whole has been made, would it be safe to frame any theory as to the causes of these earth changes.

Singularly enough, the scientific world is now working under the *second* of these theories,—with this fortuitous difference, that the phase of this theory now in vogue was framed to fit *other* local conditions where it was first promulgated, and does *not* happen to fit these local conditions here in Montana and Alberta. If this little group of four embryo scientists had started out from this locality, making this the standard for the rest of the world, they would soon have found that their scheme would not fit conditions in Europe. It is really six of one and half a dozen of the other; for the essential principle is the same in either case. Neither of them is a scientific method or hypothesis, but a mere lazy, unscientific piece of guess work.

Obviously, the *third* of the theories suggested above is the real scientific attitude. No theory worth calling a scientific hypothesis could possibly be framed until a reasonable acquaintance had been made with the rocks in all parts of the world; and it has not been until quite modern times that we have had any such world-wide knowledge and acquaintance.

Historically, we have abandoned the first of these three suggested theories, and are really in the second stage, or are following the second of these theories. The third stage in the development of a true science of Geology lies just ahead of us; we have not yet entered upon it, but it is the theory of to-morrow. It is the basis of the New Geology. But if this New Geology turns out to be also the New Catastrophism, this fact should not be held as a reproach against it. We should be willing to follow truth, unafraid of consequences. Clearly it is high time for us to discard every form and every vestige of the traditional onion-coat theory; but if after we have ex-

amined the rocks of all the globe, or a reasonable number of them, and have then framed such a theory of causes as will take into account all the large outstanding features of the strata of the world as a whole, we find that a great world Catastrophe is unavoidable as a vital part of our theory, we must not permit any uniformitarian prejudices to warp and hamper our induction.

Nor should we allow any inherited bias in favour of evolutionism to hinder us from facing the possibility that perhaps Darwin and Lyell and Buffon and the ancient Greeks may have been mistaken in trying to explain the origin of things in terms of processes now going on. Possibly there may be some things regarding origins that can never be equated with what we may be able to discover of natural law. Perhaps there are some things that are truly supra-natural after all.

"Let us not fight against facts," said Euripides, "for they can do us no harm."

—*Bibliotheca Sacra*, July, 1928

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The Case for
Creation 4,004 B.C.
A Challenge to Debate *

By Dudley Joseph Whitney
Exeter, California

(Continued from Vol.1, page 84)

One great subject remaining for consideration is the age of the earth and possibly no other subject is more important than this in determining the kind of origin and history which this globe has had. On this matter evidence is as conclusive as it well could be that

THE EARTH IS NOT OLD

Twenty-five or thirty years ago, before the adoption of radio-activity as a means of estimating the age of rocks, geologists believed that the earth was from 60 to 110 million years old and they had a simple, though poorly digested, basis for that belief. That was the annual addition of sodium to the ocean by river flow as compared with the amount in the ocean.

To start consideration of this matter it will be well to give the standard figures on the subject, in a table taken from the U.S.G.S. Bulletin 770, the fifth edition of The Data of Geochemistry, by F. W. Clarke. In the first column is given a list of substances in solution in river and sea water. Then comes the amount carried into the ocean by rivers per year in thousands of metric tons, and in the final column are the amounts

* THE PROPOSITION

4,004 B. C. is as good a date, within a few hundred years, as can be offered for the start of life on the earth.

"For in six days the Lord made the heaven and the earth and all that in them is . . .".. *Exodus* 20:11.

And God saw everything that he had made, and behold, it was very good." Genesis 1:31.

If a man does not believe that God created an ideal earth, that our parents sinned, as Genesis records, and that the ancient earth was destroyed by the Deluge, what shall he believe on the age and history of the earth, and of man?

in solution in the ocean in million million tons. Of course, much of the material brought into the ocean by rivers is precipitated quickly. This is notably true of calcium carbonate, silica and miscellaneous matter. Practically all of the sodium, potassium, magnesium and sulphate stays in solution, so these substances should be increasing rapidly in the ocean, and presumably they must have done so since the start of geologic history. The table follows:

Substance	Addition to ocean per year in metric tons x1.000	Metric tons in ocean x1,000,000,000,000,000
Carbonote (Co_2)	961,350	95.6
Sulphate (So_4)	332,030	3,353.0
Chlorine (Cl)	155,350	25,358.0
Bromine (Br)	----------	86.8
Nitrate (No_3)	24,614	----------
Sodium (Na)	158,357	14,130.0
Potassium (K)	57,982	510.8
Calcium (Ca)	557,670	552.8
Magnesium (Mg)	93,264	1,721.0
Miscellaneous	75,213	----------
Silica (Si_2)	319,170	----------
Sum	2,735,000,000 tons	46,183,000,000,000,000 tons.

The principle by which the age of the ocean (and earth) was calculated by the annual increase of sodium is easy to understand. Imagine a 20-gallon tub set under a pipe from which a pint of water leaks in an hour. By measuring the amount of water in the tub, the time since it was set under the leak can be figured. Find the addition of sodium per year to the ocean and the amount of sodium in the ocean and a basis for estimating the age of the ocean is available.

But say that some water was in the tub to begin with; the amount there at any time will not show when the tub was set under the leak, it will only provide an outside limit for such time. Say that there was much sodium in the ocean at the start (and there was) and the amount there now will not provide an estimate of the age of the ocean, but it will provide an outside limit to the age of the ocean. That is the case with the so-called age of the ocean (and earth) by the sodium measure. It never should have served as an estimate of the age of the ocean, but it should have provided a very valid limit for such age, and that limit would be far below 60 million years, a time too short for the geologic ages or for the operation of organic evolution; and that is the topic we will discuss now.

Note the great amount of chlorine in the ocean. It far outweighs all other materials combined. Even sodium, which greatly outweighs all minor substances in solution combined, is less than 3/5 as abundant as chlorine. Yet sodium is being carried into the ocean more abundantly than chlorine, and the net increase of sodium in the ocean is even greater in proportion than the table suggests, though the reasons for this need not be discussed here.

Also there is an abundance of sodium in the rocks to supply

additional sodium to the ocean as rocks weather, but very little chlorine there.. So-call primitive rocks like granite contain much sodium, but only traces of chlorine. The same thing is true of volcanic rocks, such as basalt and lava.

Volcanic gases carry some chlorine to the surface from within the earth, but they carry several times as much sulphur as chlorine and if much chlorine came to the surface of the earth through volcanic action since the world began, several times as much sulphate would have come too, and there would be more sulphate in the ocean than chlorine, instead of only about 1/7 as much sulphate as chlorine.

The conclusion is plain that the ocean must have contained much chlorine from the beginning, and if it did, it certainly would contain much sodium, sulphate, magnesium and potassium, and the rivers cannot have been running long, as geologists count time, without making the ocean far richer in all of these substances, than it is.

Do some simple arithmetic on the subject. Divide the figures for sodium in the ocean by those of sodium in river water. The outside limit of the age of the ocean by sodium is less than 90 million years (not allowing for cyclic sodium and some other factors of minor importance). But say that nine-tenths of the sodium was in the ocean to begin with; the ocean then would be only nine million years old or less.

For sulphate the outside limit of the age of the ocean would be about 10½ million years, but allow 9/10 of the sulphate there at the start, and the outside age of the ocean would be roughly, 1,500,000 years, and this is only half of it. Enormous quantities of sulphate enter the ocean from the air. This comes from volcanoes, which emit great amounts of that element and its compounds. The sulphur oxidizes, passes into the air, descends in rain, mostly into the ocean, and the annual increase of sulphate in the ocean is doubtless twice that indicated in Clarke's table, and most of this is a net increase, for cyclic sulphate must be far less than cyclic sodium and chlorine.

All of the magnesium of the ocean should be added in less than 20 million years and all of the potassium of the ocean in less than 10 million years. Allow for the amounts of these in the ocean to begin with, and the ocean can hardly be more than a million years old, and there is no saying how young it may be, within a few thousand years. The whole proposition of an old earth is nonsense when considered from the viewpoint of the increase of saline matter in the ocean, and in connection with the above it can be said that only traces of sodium, sulphate, magnesium and potassium pass out of solution from ocean water, common statements of geologists to the contrary notwithstanding. If any geologist wishes to take me up on this statement, I shall be delighted. And that is that.

But the rapid increase of sodium, sulphate, magnesium and potassium in the ocean is only one of several evidences that the earth is not old.

Take the matter of volcanic activity, which was mentioned

earlier in connection with the recent uplift of the land. Over many great areas of the globe enormous quantities of volcanic material have been erupted recently. Before eruption it was held within the earth's crust like steam in a boiler, under high pressure. It is beyond belief that it could have been kept there for thousands, or hundreds of millions of years, or for any long period of time, while great changes were being made in the face of the earth, without erupting.

But return again to Clarke's figures on the salts of river and sea water; note the astonishingly great amount of calcium carbonate ($CaCO_3$) carried each year from the land to the ocean. This is the practical equivalent of three-fourths of a ton of limestone for every human inhabitant of the globe, and presumably leaching like this occurred since rains began to fall and rivers to run. But in an old earth the calcium of the lands would soon be almost exhausted; it would have been deposited on ocean floor. Yet it is not: the lands are still rich in lime, save close to the surface in areas of plentiful rainfall. Clarke's work shows that the lands in general are as rich in calcium as the plutonic rocks from which they were supposedly derived—far richer than granite, which is often alleged to make the base of the land masses. The lands have not been subjected to long leaching. The fact is plain.

Consider helium, the gas next heavier than hydrogen. It is produced by the decay of uranium and thorium, of which we have heard so much since the atomic bombs were exploded. As the rocks weather the helium in them passes out into the air, but the air contains very little helium.

On this matter Harold Jeffreys, an outstanding British physicist, says in his work on The Earth, "If the average age of igneous rocks when denuded was 160 million years, all of the helium in the atmosphere would be explained if the average thickness of igneous rocks denuded was 40 meters. This is an impossibly small amount." In other words, the amount of helium in the atmosphere is far too small for an old earth, just as the amounts of sodium, sulphate, magnesium and potassium in solution in the ocean are far too little for an old earth.

Is there an answer to this? Let it be offered and it can be torn into shreds. Jeffreys did not know what it could be; otherwise he would not have said that it was *an impossibly small amount.* And this brings us to one of the most critical features of the whole problem of the earth's age and history, that is

RADIOACTIVITY ESTIMATES OF THE AGE OF ROCKS

For many years the National Research Council has had a committee at work on the measurement of geologic time, and most of the work of that committee has been devoted to the study of the supposed ages of rocks by means of radioactivity.

For a number of years their favored estimate of the age of

the earth was 1,800 million years; then it was upped to 2,000 million years. Now it is 3,350 million years—unless such estmate has been altered recently. This would presumably allow land leaching to continue all that time without supplying the ocean with more saline matter than it has, or depleting the lands of calcium, and so on. The thing does not make sense.

All of these features deny the possibility that the earth could be more than a very minor fraction of the ages which have been claimed for it. That should discredit the supposed findings of the committee. Therefore the principles on which the committee bases its conclusion should be studied.

The theory used in estimating the age of rocks by radioactivity seems sound—if it is not investigated too carefully: certain radioactive elements, uranium and thorium, change slowly, but at definite speeds, into lead and helium. Find the amounts of uranium and thorium in a rock and the amounts of lead and helium that have been derived from them, and we have the age of the rock. Simple, is it not? Too simple; if there were no lead or helium in the rock to begin with, the theory of the thing would be excellent, but if some of these elements were there to begin with the amount there now would be meaningless as far as the age of the rock was concerned, and evidence is abundant that both helium and lead were present and widely distributed in the rocks when the land was uplifted and the rocks came into place.

On helium: this is an abundant and widely distributed element in the universe, though little exists on the earth. It occurs in practically all igneous rocks. Also it is abundant in certain natural gases, and issues in great amounts from certain springs. Nearly every igneous rock when heated gives off nitrogen and other gases, and it seems most unscienific to suppose that the nitrogen was there at the start but the helium was not. The helium measure of time must be held worthless. The annual reports of the committee contain many criticisms of it.

The fallacies tied to the estimates of the age of rocks by the lead content are even more glaring than those of helium. Hardly a rock is analyzed which does not contain far more lead than would be produced by the uranium and thorium of that rock. For instance, the great Whin Sill of northern England is given an age of 250 million years by radioactivity, but it contains many times as much lead as would be produced by radioactivity; 3 to 5 grams per ton as against the 0.049 grams that the uranium and thorium would produce. Authority for this is Dr. Alfred C. Lane in the Smithsonian Report for 1937, page 249. Dr. Lane was the first, and long time, chairman of the committee mentioned.

Clarke in The Data of Geochemistry, published seven years after Arthur Holmes had gotten out his first book on The Age of the Earth (1919), rejected the radioactivity estimates and pointed out that certain minerals from Llano county, Texas, gave ages by the lead measure of 10,350 and 11,470 million years, while other minerals from the same place tapered down

to 1,671 million years. These ages are both ridiculously high and inconsistent with one another.

Naturally defenders of the radioactivity estimates have a way to explain this which seems plausible. All lead is not the same weight; that formed from uranium and radium decay has an atomic weight of 206; that derived from thorium a weight of 208, and a lighter lead has a weight of only 204. Reference books usually state the weight of lead as about 207.2 so 204 lead must be a minor fraction of the whole. But 204 lead is often found in appreciable quantities in rocks studied for radioactivity. If it was not expelled when the rock material came into place, certainly the 206, 207 and 208 lead there was not expelled either, and the amounts there now are absolutely meaningless in relation to the age of the rocks. What about it? An explanation that will make sense would be appreciated.

Let us consider some other angles to the subject. For many years astronomers have taught the theory of an expanding universe: that the gallaxies of stars came into being by the explosion of a "cosmic atom," or whatever it might be called, 2,000 million years ago. That start 2,000 million years ago corresponded nicely with the assumed age of the earth, which was then assumed to tbe 1,800 or 2,000 million years old. Now, however, the earth is said to be 3,350 million years old, or 1,350 million years older than the universe of which is it a part. The whole proposition is nonsense.

There should be no need to discuss the subject more, but a few statements taken from the annual report of the committee named may show upon what a flimsy foundation the theory of radiocativity rests as a means of estimating the age of rocks. The year of the report will first be given, then the statement.

1937-38, p. 109, "Knoph mentioned that there were only three Post-PreCambrian lead results that were sufficently well studied and geologically determined to pin our faith on at present." Think of that: more than 20 years after Holmes' book on the age of the earth was published only three different rocks later than PreCambrian had been properly located and analyzed. PreCambrian (so-called) rocks should not count, as they might be anywhere from 3,350 to 500 miliion years old and no one could say whether such age was too large or too small for their location.

The test of three rocks by the lead measure should be meaningless in establishing a theory, unless helium measures were reliable and in harmony with the lead estimates, but the contrary was the case.

1939-40, p. 62. "For many years it has been known . . . that 'helium' and 'lead' ages for the same mineral did not check. The former was from 1/3 to 1/10 of the latter. That is discord, not harmony.

Same year, p. 76. "However, a number of uncertainties, particularly of a geological nature, remain in the lead method."

Same year, p. 63. "A quite clear indication that in the process of mineralization there has been a wandering of helium.

by which unusually large amounts of helium are found in the relatively younger rocks." If any person wants this in simple English, it simply states that while the supposedly old rocks may show old ages by their helium content, old ages are also shown for the supposedly younger rocks. That is the reverse of sound science.

Radioactivity estimates of the age of rocks and of the earth need not be discussed more, at least until some defense for them is offered. The subject has been discussed at some length here because radioactivity is held to show conclusively that the earth is old and that ages occurred. Once this is admitted to be wrong ages geology and evolution must collapse like a house of cards.

CLOSING OBSERVATIONS

There should be no need to summarize the case that has been made, or to repeat any arguments, but certain things may be said in closing.

Any person who upholds the old-earth, ages theory must admit the failure of all past attempts to explain the evolutionary origin of the earth and either admit the reasonableness of belief in the creation of the earth, or submit a theory for its evolutionary origin which he is prepared to sustain against criticism, or else say that the evolutionary origin of the earth should be believed in spite of the evidence against it.

On the creation or evolution of plants, animals and men, so much depends upon the age and history of the earth that the subject cannot be discussed intelligently unless this matter is decided. Creationists who allow the old-earth theory are forced by implication to the position of theistic evolution, whatever that may mean, and in fact that is exactly where nearly all of them stand, or they leave the problem of the origin of living things undecided. In this connection nothing more need be said now on the problem of human origins and languages, important as that is.

On the recent uplift of the land, the fact of such uplift is unquestioned; also the fact that much uplift was recent. How recent should be decided, with evidence for such decision, by any defender of ages geology, and with it a defense of ice-age theory or its abandonment. Also the matter of the recent uplift of the land should be fitted to ages geology, if that is possible.

Give evidence for Deluge geology as against ages geology the value—if any—that it merits; then face the problem of the age of the earth as a factor of critical importance, and these features are critical. Radioactivity estimates of the ages of rocks and of the earth must be defended or discussed. If defended, some way must be found to reconcile the asserted great age of the earth with evidence from land leaching, volcanism and so on that the earth is not old. Otherwise the whole proposition of the earth being old stands discredited or held on the shameful basis that sometimes, perhaps, evidences that the earth is not old can be explained away.

As has been said, a public challenge has been issued to debate this case, with the writer offering a substantial forfeit if he can-

not sustain his case for Creation 4,004 B. C. against some very different time for the start of life on the earth. If the case presented has real merit it should be accepted; otherwise it should be refuted.

If any geologist of standing, or other person qualified in the eyes of the public to uphold the case of ages geology, is willing to accept that challenge, correspondence is invited with The Christian Evidence League, Box 173, Malverne, N. Y., or with the writer.

DUDLEY JOSEPH WHITNEY,
EXETER, CALIFORNIA.
February, 1950.

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Why Is Evolution Believed?

By WILLIAM J. TINKLE, Ph.D.
Professor of Biology

WHEN students have examined the slender and broken threads of evidence which uphold the theory of organic evolution, they sometimes ask why so many people believe in it. It is true that the majority of biologists and geologists profess a belief in at least some phases of the theory, and it is taught as a doctrine in many colleges, high schools, and even some public schools. Some years ago, the statement was made that all biologists accept the theory. The only way this statement could be supported was to say that any one who did not believe it was not worthy of the classification of biologist. But it does attract many adherents, and people wonder why.

The first reason I shall cite is inexact definition. Charles Darwin gave a fair definition when he said organic evolution means that all the species of animals and plants in the world, including man, developed by a series of changes from one or a few simple forms. This is exactly the idea which evolutionists still hold, and to which the theologians object.

But a modern scientist has said that evolution is the theory that present plants and animals arose from earlier forms by a long process of descent with change. It will be observed that this definition is much less exacting than that of Darwin, for it states nothing about the extent of the changes or anything about the direction. But his further discussion makes it clear that he means the very same thing.

Some even state that evolution is the sum total of the changes that occur in organisms. This is nothing less than a begging of the question. When people see that there is a certain amount of variation among plants and animals they are inclined to be favorable to the theory of evolution; while the backbone of that theory is the doctrine that man developed from a one-celled animal.

The second reason for belief in what we consider a colossal blunder is the faulty opposition by its enemies. It is easy for a speaker or writer to crack a cheap joke at his opponents. His reward in applause is immediate and may be copious, but he has lost the ear of the thoughtful man. Likewise appeals to prejudice do not win the thoughtful man, and he is the very one we cannot afford to lose. Here is an example. An evangelist said, "If I thought I had come from a monkey I would hunt a gorilla in the jungle and say, 'Grandma, I am so glad to see you.'"

Reason number three is faulty reasoning, such as analogy. One is told that if he does not believe in evolution he should not believe the world is round. There is but little similarity in the two beliefs. There is much stronger analogy between Darwin and Tycho Brahe, who opposed the idea of the earth revolving about the sun. Another analogy opposed to evolution is that species of animals can be expected to deteriorate just as our solar system is slowly running down. The speed of the earth is slowly slackening, the sun is either cooling or shrinking, why should the organic realm be an exception?

Reason number four, people do not know the Bible. An instructor in a large university taught that evolution was true and special creation false. In a gesture of fairness she told her students to read the first three chapters of Genesis. One young man the next day said he was surprised to find Genesis "such bunk." He was ignorant of the message and wording of the Bible, and a single reading did not break down the opposition. The teacher seemed pleased at his attitude.

REASON NUMBER FIVE is very important. Many do not know the recent discoveries of science. They may know some of them; but modern scientists are so specialized that they do not know the whole field. Acquired characters, those

Science Retreats toward Genesis

By Dudley Joseph Whitney, B.S., Exeter, Calif.

HALF a century ago certain standard teachings of scientists were definitely in conflict with Genesis, provided Genesis was taken in a direct and natural way. But great changes have taken place since then in the position of scientists about creation and the nature of the early earth. It is too much to say that scientists have come to accept Genesis, but certainly changes in their views have largely been in favor of what Genesis states.

The situation can perhaps be best shown by reviewing some of the standard beliefs of leading scientists of a generation ago and by naming some changes which have occurred since then. The older science was definitely mechanistic. Nature was assumed to be self-acting, and unfortunately this view, which is that of evolution, still dominates much of the reasoning of scientists, but there is a movement away from it.

Coming Back to the Supernatural

David Starr Jordan once wrote in *Creation by Evolution*: "But the lesson of all science is that whatever takes place in nature is natural, not 'supernatural.' Indeed, to science 'supernatural' is a meaningless word." Recent discoveries regarding the nature of matter have altered this position, so that Sir James Jeans, one of the greatest British physicists, now writes in *This Mysterious Universe:* "These concepts reduce the whole universe to a world of light . . . so that the whole story of the creation can be told with perfect accuracy and completeness in the six words: "God said, Let there be light."

"Let there be light" was not in fact the first act of creation, but the quotation is nevertheless significant. The greatest physical scientists are nearly all believers in creation, and Jordan's dictum is now bad science.

The older scientists believed that a gigantic nebula had contracted to form the solar system. They believed that the earth was once fiery hot and has gradually cooled and reached its present condition through geologic processes similar to those which act now. When they found the fossils of dinosaurs and other extinct animals, they figured how such creatures could have become buried by processes like those which operate now. When they found great coal beds, one above another, they tried to visualize the means by which great masses of vegetation could grow and be covered to become coal. They as-

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changes which are results of environment, use or disuse, are not inherited. This discovery invalidates the arguments of Lamarck and his followers. Mutations are inherited, but they are never in an upward direction. They do not make an animal or plant stronger, more complex, or more symmetrical, and most of them make it distinctly weaker. The discoveries of the last twenty-five years have led distinctly away from evolution.

The last reason is that many wish to believe the theory, as the following incident illustrates. A professor was presiding over a meeting of instructors and assistants, discussing plans for teaching the development of life. After he had pointed out that several possible statements in favor of evolution would not be well founded, one of the instructors said, "Doctor, why do you believe in evolution?" His answer left me astounded. "So that I will not have to believe in anything supernatural." Trained as I was to believe that the essence of science is to evaluate data without prejudice and thus believe what one must, it was disconcerting to hear my superior say that he let his wish be his arbiter. Yet evolution has done the same to others, for I have heard them say that it is the religion of the scientist.

If these first-hand observations of a science teacher reduce the magnitude of this disturbing enigma in the minds of inquiring youth, they will have performed their function.

Moody Monthly November, 1940

sumed that sedimentary rocks which contained the fossils were laid down in different periods of the earth's history, and that what they called the older rocks were always under what they called the younger rocks when the two were in the same column of the earth's crust. Darwin's theories convinced many scholars that great transformations of species could occur naturally, and that a reasonable line of descent of man from one-celled ancestors was known.

Naturally all this caused the conviction that the earth was very old and there was no creation of Adam or any Noachian flood. If this kind of a history were to be believed consistently, little of the Bible could remain except some history of doubtful authenticity, some fine poetry, and some moral and spiritual admonitions.

Some Scientific Beliefs Abandoned

Great changes have occurred since such beliefs were standard. Darwin's theory of natural selection as an agency for great species change, has been discarded by all but a few biologists. The remainder, though they believe in evolution, realize their helplessness to understand how it could operate.[1] Hypothetical lines of descent for man and the higher animals become more and more unsatisfactory the more carefully they are examined.

The Nebular Hypothesis has been discarded. No astronomer now believes that a nebula contracted into the solar system. When this hypothesis was found false, the theory was advanced that a passing star pulled matter from the sun from which the earth was formed, but this theory is now rejected too. Every possible theory for the naturalistic origin of the earth has been weighed in the balances and found wanting[2].

Meanwhile fiat creation has in effect been recognized as the cause of the universe. The stars of our galaxy seem to be moving away from a common center, which caused a Belgian priest-scientist a few years ago to suggest that our universe started in a great act of fiat creation like the explosion of a gigantic atom. This theory has wide acceptance.

Advance in geology is, however, more significant in a way than the change in astronomy and physics. Most of the basic dogmas of the older geologists have given way to uncertainty. Most geologists still believe that the earth started hot, and cooled, but many geologists disbelieve this. The old idea that the earth is cooling and shrinking and so causing the mountains to rise, meets so many difficulties that it is seldom accepted. Modern geologists simply do not know how to account for mountain uplift and for other of "the grander phenomena of geologic history."

The Flood Now Seen Necessary

Sedimentary rocks are now known to occur over large areas which show no material signs of disturbance except uplift, but the strata are in the wrong order entirely for the ages. Geologists still assert that the upper rocks were "overthrust" upon the lower ones, but they are unable to suggest how such overthrusting could occur, or how it would leave the line of contact so smooth and apparently undisturbed if it did occur.[3]

Many sediments are also acknowledged to have been laid down quickly. An animal normally decays so rapidly after death that burial must have been very rapid to permit the preservation of large (or small) fossils. Thus Dr. Arthur Holmes writes in *The Age of the Earth:* "Individual beds (of fossils) may have been deposited very rapidly, as indeed they must have been to insure the preservation of large fossils." When we think of great beds of dinosaur fossils, many of them as large as an elephant, we must figure that nothing but a Noachian flood could bury and preserve them so well.

Coal gives strong evidence of flood conditions. Most geologists still try to believe that much coal came by the vegetation growing in the place where the coal formed, but there is evidence against this. F. W. Clarke writes in U. S. Geological Survey Bulletin 770, *The Data of Geo-chemistry:* "In some cases beds of lignite represent submerged forests; and in others, as shown by many geologists, the coal was probably formed, not from vegetation in place, but from drifted materials" (p. 758). An enormous flood would be required to form coal beds. Cannel coal is even composed largely of spores or pollen. Extraordinary conditions would be needed to accumulate an enormous mass of pollen and bury it as a great coal bed.

Here, therefore, acknowledgment is made that many sediments were deposited quickly, not gradually, as it was thought they were when the geologic history of Darwin's day was written; and rocks often occur in the wrong order for the ages. The implications of these facts are not admitted, but the facts themselves are.

What the Nevada Basin Reveals

Mountains of sedimentary rock are admitted to be of fairly recent uplift, and one of

[1] *Evolution, The Way of Man,* by Vernon Kellogg.
[2] *The Solar System and Its Origin,* by H. N. Russell (former president of the American Association for the Advancement of Science).
[3] Books of George McCready Price and Byron C. Nelson; various textbooks in geology.

the most striking findings in this connection relates to what is called Lake Lahontan, a great basin covering a large part of northern and western Nevada. This never had an outlet. Water flowing on to the floor of the basin remains until it is evaporated. Various salts carried in solution in the streams remain in several shallow alkaline lakes on the basin floor. J. Claude Jones, geologist of Nevada University, determined the amount of saline matter in the streams and on basin floor and found that the basin by this and some other tests was approximately 4,000 years old.[4] Some neighboring smaller basins indicate a similar age. The unavoidable conclusion would seem to be that the mountains surrounding this basin were uplifted not far from the time Ussher estimated the flood occurred.

If the implications of all these things were faced, scientists could hardly avoid accepting a history of the earth similar to that which Genesis records. They have not allowed the implications, but they have allowed the facts upon which these implications are based, and a Christian scholar can hardly ask more than that at present.

[4]*Quaternary Climates: Geologic History of Lake Lahontan* Publication 352 of the Carnegie Institution of Washington.

Moody Monthly June, 1937

THE LUTHERAN WITNESS
OCTOBER 17, 1961—

? Are the six days of creation to be understood as ordinary days, or may they be taken as longer periods?

The word *yom* (Hebrew for day) is used 1,152 times by the Old Testament writers. Moses uses it 344 times in his five books (the Pentateuch) and five times in Psalm 90. In the Book of Genesis, which begins with the creation story, he employs it 65 times.

Thirty-four times in Genesis *yom* occurs in such phrases as "the day, this day, on this day, today, day of death, day of distress"; 17 times it occurs with numbers: one day, the first day, the second day, etc.; nine times the term signifies daytime in contrast with the night; in five cases it appears to be used in the more general sense of time. In no case does Moses use *yom* to denote a longer period.

In Psalm 90 the word occurs five times, always in the meaning of an ordinary day. Though verse 4 states: "For a thousand years in Thy sight are but as yesterday when it is past and as a watch in the night," one can hardly say that the word *day* is here used in the sense of a longer period. For yesterday, when it is past, was simply an ordinary day.

Four Scriptural facts speak strongly against any interpretation that would make the days of creation in Genesis 1 longer periods of time:

1. The repeated statements of Moses: "The evening and the morning were the first day," etc. (vv. 5, 8, 13, 19, 23, 31). This can refer only to ordinary days, not to long periods.

2. The creation of the sun on the fourth day to give light on the earth — in place of the primitive light created on the first day — which brought about the evening and morning (Gen. 1:14-19). The sun is performing that service even now, every 24 hours.

3. In Ex. 20:8-11 Moses records the institution of the weekly Sabbath. God's people were to work six days and rest the seventh day, just as God had created the heaven and the earth in six days and rested on the seventh (Gen. 2:3). The Jewish Sabbath was a weekly day of rest, extending from sundown Friday to sundown Saturday, an ordinary day.

4. Jesus placed His divine approval upon the five books of Moses, quoting repeatedly from all of them. He expounded from Moses and the prophets the things which the Spirit of God had revealed concerning Him, the promised Messiah (Luke 24:27, 44). In Matt. 19:4 and Mark 10:6 He affirmed that Adam and Eve, who were created on the sixth day (Gen. 1:26-31), had been made by God "at the beginning," not hundreds or thousands of years after the formless and void earth mass had been called into existence. (Gen. 1:1)

On the basis of the Holy Scriptures — and what other reliable basis have we? — the six days of creation are to be taken as natural days.

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